# RAPTOR RESEARCH NEWS

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RAPTOR RESEARCH FOUNDATION, INC.

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Editors: Byron E. Harrell; Donald V. Hunter, Jr.

The *Raptor Research News* is designed as an informal information exchange. Contributions are edited, but are not usually submitted for refereeing as in formal scientific journals of record. Some of the items are progress reports or expressions of ideas to stimulate discussion; thus citations of contents of the *News* should be avoided unless approval is received from the author.



**RAPTOR RESEARCH FOUNDATION, INC.**
**c/o Biology Department**
**University of South Dakota**
**Vermillion, South Dakota 57069 U.S.A.**

**Peregrine Breeding Recovery in England.** Jack Mavrogordato reports from England (personal communication) a dramatic recovery in the number of breeding pairs of peregrines—up to 50% of the number of known breeding pairs before the decline generally attributed to pesticides. As yet, however, the breeding success is only one fledged young per eyrie as compared to about 2.5 before the decline.

**RRF Tax Exempt.** The Raptor Research Foundation, Inc., has been determined by the director of the Internal Revenue Service to be tax exempt. This means that gifts, grants, and contributions are deductible by the donor.

**Hawks Needed for Experiment.** A request has been made for anyone who might be interested in using their trained hawks in experimental bird damage control situations in Kansas. Anyone so interested should contact Mr. F. Robert Henderson, Extension Specialist, Wildlife Damage Control, Cooperative Extension Service of Kansas State University, Fairchild Hall, Manhattan, Kansas 66502; phone 913-539-6731.

**Commendation for the Pathology Committee.** We would like to especially commend and congratulate the pathology committee for providing a very useful service to those working with raptors. Most who have had experience with handling birds of prey know the frustration of trying to get competent help in treating injuries or ailments. Now for the cost of a phone call you get a specialist consultation for yourself and/or your veterinarian. We hope you will use this service promptly and not wait until the ailment has progressed to an incurable stage. It is the editors' view that we owe at least this much to birds in our care. If a bird should die by all means avail yourself of the post-mortem service which may well provide knowledge that will prevent future losses.

**Books.** David Hancock offers for sale a booklet, *Adventures With Eagles*, by Lyn and David Hancock. Paperback—$1.50; hardcover—$3.95. Also for sale is an 80 page book (which we have not seen) entitled *Wild Islands*. Paperback—$4.95; hardbound—$7.95.

**Eberly Resigns.** With this issue Lee Eberly is terminating his services to the Foundation. We thank him for his invaluable work and wish him luck in the future.

# MANAGEMENT OF THE AMERICAN OSPREY ON THE DESCHUTES NATIONAL FOREST, OREGON

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## INTRODUCTION

Insufficient data are available to establish the nationwide population status of the American Osprey (*Pandion haliaetus carolinensis*). The Committee on Rare and Endangered Wildlife Species (1967) has directed attention to the Osprey by listing it as "status undetermined" in the "Redbook."

In Oregon, Newberry (1857) found ospreys in all parts of the State he visited, including the Cascade Range, the Klamath Lakes, the Willamette Valley, and the Columbia River. Osprey populations have declined since then. Gabrielson and Jewett (1940) considered the Osprey to be one of the rarer Oregon hawks. Marshall (1969) also classified it as rare. He reported 56 active nests in Oregon, plus an additional seven pairs that probably nested in the State. All but 12 of these nesting pairs were found on the Deschutes National Forest in Central Oregon; most of them at Crane Prairie Reservoir.

The Crane Prairie Reservoir Osprey colony, in existence less than 30 years, is an incidental result of past land management practices. Recognizing the uniqueness of this colony, which is the largest in the Pacific Northwest, the U. S. Forest Service and Oregon State Game Commission decided to intensively manage and protect the birds and their habitat. As data was unavailable on which to base management decisions, informal administrative studies were initiated by both agencies. The areas studied were nesting, in order to evaluate success of future years, and habitat, to determine the Osprey's requirements for survival. Oregon State Game Commission made the initial censuses in 1966 and 1967 in conjunction with waterfowl surveys, and the U. S. Forest Service made surveys of Osprey habitat and nesting success in 1968 and 1969.

## ESTABLISHMENT OF A MANAGEMENT AREA

The Crane Prairie Reservoir Osprey Management Area was officially established by Memorandum of Agreement on October 10, 1969, by signatures of the Regional Forester, Pacific Northwest Region, U. S. Forest Service, and Director, Oregon State Game Commission. The Memorandum of Agreement was supplemented by

a formal management plan which spells out the responsibilities of both agencies in managing the Osprey and other wildlife on the 10,600-acre Management Area. Establishment of the area was under the authority of the Endangered Species Preservation Act of October 15, 1966, which authorizes the Secretary of Agriculture to protect species of native fish and wildlife that are threatened with extinction, and to preserve the habitat of such threatened species on lands under his jurisdiction.

The Management Area includes the 3,850-acre reservoir plus a 6,750-acre contiguous buffer strip, which together contain approximately 80 percent of the nesting ospreys on the Deschutes National Forest. Additional acreage will be added to the Management Area if new concentration areas warrant special management.

## DESCRIPTION OF THE AREA

Crane Prairie Reservoir is located on the Bend Ranger District, 30 miles southwest of Bend, Oregon. It was created by a temporary dam on the upper Deschutes River by irrigation interests in 1922. The dam was replaced by a permanent earth and rock fill structure in 1939 by the Bureau of Reclamation.

The reservoir covers 3,850 acres and has 20 miles of shoreline when filled to the designed capacity of 55,000 acre feet. It was flooded without clearing the timber, leaving approximately 1,500 to 2,000 acres covered with lodgepole pine (*Pinus contorta*) and ponderosa pine (*Pinus ponderosa*) snags (dead trees). Some of these snags have fallen but many are still standing today; they can be expected to last for 10 to 20 years.

The reservoir was closed to fishing until 1949 to protect an egg-taking operation. By this time, there was an excellent population of rainbow trout (*Salmo gairdneri*) and brook trout (*Salvelinus fontinalis*). Tui chub (*Siphateles bicolor*), an undesirable species, was accidentally introduced into the reservoir around 1952, and was found in considerable numbers by 1955. These have increased to 87 percent of the total fish numbers (Campbell and Locke, 1967). The Osprey buildup apparently coincided with the increase of fish, as few were reported prior to the 1950's.

The combination of a high forage fish population and numerous nesting sites on the snags has created suitable habitat for at least 35 nesting pairs of birds. In nearby snag-free Wickiup Reservoir where the fish population is lower, no Osprey are known to nest.

## METHODS OF MANAGEMENT

The primary objectives of the Crane Prairie Reservoir Osprey Management Area are to protect and enhance the Osprey habitat; to

protect the birds and their food supply; and to provide public enjoyment. Secondary objectives are to protect the endangered (in Oregon) northern Bald Eagle (*Haliaeetus leucocephalus alascanus*) and rare greater Sandhill Crane (*Grus canadensis tabida*) (Marshall, 1969), and their habitats; and to intensively manage the fish, waterfowl, shore birds, song birds, big game and other wild mammals of the area and their habitat.

Management of the Osprey habitat will be largely through preservation of the existing reservoir snags. Approximately 800 acres of snags have been cleared in the last 3 years to enhance recreation, grazing and waterfowl nesting. A buffer strip has been left around all Osprey nests. No additional clearing is planned except for fallen snags. These will be removed as they float onto the beaches.

The standing reservoir snags, which are now the key to successful Osprey nesting, are expected to fall within 20 years; therefore, shore nesting sites will be needed as replacements. The standing green timber around the reservoir is recognized as the key to future nesting success and will be reserved for this purpose. Cutting will not be permitted except for danger trees and road rights-of-way in a 200-foot-wide strip of timber, immediately adjacent to the reservoir. Beyond the 200-foot-wide strip, a 1,120-foot-wide "restricted cutting" strip has been established. Here, a minimum of two dominant trees per acre will be saved for potential nesting sites. No snags will be cut within any part of the timbered portion of the Management Area.

Regulations also restrict activities around Osprey and eagle nests found throughout the Deschutes National Forest. These include a 132-foot-wide "no cut" buffer zone around each nest and a "restricted activity" zone within 660 feet of a nest during the nesting season.

Osprey habitat improvement projects are planned. Nesting snags will be created, by killing the most suitable trees in the green buffer strip. Artificial nesting sites will be erected as needed to replace the toppled snags. Goose nesting structures will also be installed to alleviate the competition between the geese and ospreys.

Shooting, both deliberate and accidental, has been recognized as a hazard to ospreys at Crane Prairie Reservoir. To more fully protect the birds, the entire Management Area has been closed to hunting during the nesting season (April 1 to September 30). Most of the ospreys have migrated by the latter date, so chance of accidental shooting is slight. Waterfowl and big game hunting is permitted after September 30.

A nest harassment problem exists and will be investigated further. The critical sections of reservoir will be watched closely, and if disturbances continue, use of these areas may be restricted.

The present food supply apparently is adequate for all of the

fish-eating birds of the reservoir—Osprey, Bald Eagle, Great Blue Heron (*Ardea herodias*), Double Crested Cormorant (*Phalocrocorax auritus*), Belted Kingfisher (*Mergaceryle alcyon*), and Common Merganser (*Mergus merganser*). This is provided partly by the greater numbers of tui chub that infest the reservoir and compete with the trout and kokanee for food and space. The excessive numbers of tui chub have created a problem in that providing food for the birds is in conflict with management of a good cold water fishery. Reduction of these fish could have a detrimental effect on the welfare of the Osprey and the other fish eaters, including the river otter (*Lutra canadensis*). The U. S. Forest Service and Oregon State Game Commission have agreed that any tui chub control program will be preceded by thorough research and fully coordinated between the agencies. The Osprey will be given full consideration if such a program is needed.

There is mounting evidence that nesting failures of ospreys and other birds are tied directly to pollutants, the chlorinated hydrocarbons used in insect control work (Hickey, 1969). Use of these pesticides so far has not been a problem on the Forest. To assure that no problem does develop, these chemicals will not be used in Crane Prairie Reservoir and its watershed.

Crane Prairie Reservoir is a heavily used recreation complex on the Deschutes National Forest, noted for its trout and kokanee fishing and waterfowl hunting, and is also popular with bird watchers and photographers. Therefore, a large scale information and education program will be initiated. This will include placement of permanent signs explaining the ecology of the Osprey, and also the concern of the U. S. Forest Service and Oregon State Game Commission for this potentially endangered species. The message will also be carried to the public via a brochure and visual aids, such as movies and slide programs.

## RESULTS OF STUDY

### Osprey Numbers and Nesting Success

No official records were kept on Osprey numbers before 1966. Nelson (1970), however, provided invaluable information from his personal records for the years 1947 to 1967. Following are dates of observations and number of active nests that he saw:

| Date | No. of Active Nests | Date | No. of Active Nests |
|---|---|---|---|
| April 1, 1947 | 16 | April 1, 1958 | 22 |
| May 30, 1948 | 16 | May 31, 1959 | 24 |
| May 29, 1949 | 19 | May 29, 1960 | 21 |
| May 28, 1950 | 23 | May 28, 1961 | 24 |
| April 3, 1951 | 18 | May 27, 1962 | 25 |
| April 1, 1952 | 20 | April 2, 1963 | 22 |
| May 31, 1953 | 22 | May 31, 1964 | 25 |
| May 30, 1954 | 23 | May 30, 1965 | 25 |
| May 29, 1955 | 23 | April 30, 1966 | 26 |
| May 27, 1956 | 20 | April 29, 1967 | 25 |
| May 26, 1957 | 22 | | |

In August 1966, Oregon State Game Commission personnel counted 46 ospreys at Crane Prairie Reservoir. In August 1967, 56 birds were counted (Bright, 1967). No bird census was made in 1968, but Anderson (1968), an independent observer, reported 27 active nests.

In 1969, studies were expanded to include the entire Deschutes National Forest. Ground and water search was made for Osprey nests by U. S. Forest Service field personnel in conjunction with their other duties. Each site was numbered, located on aerial photos, and cataloged. Recorded were nest condition, size and species of snag or tree, habitat type, distance to other nests, distance to water, date of last known use, and 1969 nesting success.

The 1969 Osprey nesting search on the Forest showed:

| | | |
|---|---|---|
| Active nests, successful | 25 | |
| Active nests, later abandoned (not including renests) | 18 | |
| Active nests, success unknown | 5 | |
| Total active Osprey nests | | 48 |
| Nests built after 7/1/69 | 10 | |
| Renesting attempts using established nests | 3 | |
| Total renesting attempts | | 13 |
| Non-breeding pairs associated with established nests | | 7 |
| Total nests used by Osprey in 1969 | | 68 |
| Number of young | | 35 |
| Brood size | | 1.4 |

The known 1969 breeding population on the Deschutes National Forest was 48 pairs. Of these, 37 nested on or within 1 mile of Crane Prairie Reservoir. Nine additional pairs nested within 7 miles of the reservoir. The 2 remaining were found at distances up to 25 miles from the reservoir. Seven other pairs associated with established nest sites, but none of these gave the appearances of active nesting and

were assumed to be immature birds.

In 1969, ospreys were first noted on April 12 along the ice-free Deschutes River below the reservoir. The first Osprey was seen on Crane Prairie Reservoir on April 15. This is considered late, but probably resulted because 90 percent of the reservoir was covered by ice then.

Full-scale nesting did not begin until about the first week of May, when most of the birds had arrived. Six Osprey nests were already occupied by Canada geese (*Branta canadensis*). One of these nests fell apart and was abandoned by the geese, to be rebuilt by ospreys for a successful nesting attempt.

A total of 68 Osprey nests was used in 1969. Forty-eight of these showed evidence of incubation and were considered to be active nests. Based on 25 of these active nests where the outcome could be determined, production on the Deschutes National Forest was 35 young or 1.4 birds per brood. Single birds fledged from 16 nests, 2 from 8 nests, and 3 from 1 nest. Success was not determined on 5 nests.

The first fledgling left the nest approximately August 5, and most young were flying by August 20. The last bird fledged between September 5 and 10.

The south bound migration was triggered during early September. Approximately three-quarters of the birds had left Crane Prairie Reservoir by September 15, are the last bird was seen on October 1.

## Osprey Nesting Habitat

Nesting was largely limited to lodgepole pine and ponderosa pine snags in the reservoir because there was little else to choose from. Most of these nests were built on stubs, broken off well below the original tree height. The lowest of these was only 10 feet above the water.

Adjacent to the reservoir and at higher elevations where many other trees and snags were present, ponderosa pine was the preferred species. One possible explanation is that the tops of overmature ponderosa pines characteristically flatten and form a natural basket in which ospreys prefer to build nests. When green trees were used, the majority had spike (dead) tops. All nests were located at or within a few feet of the top of a snag or live tree. Other tree species used for nesting were white fir (*Abies concolor*), Engelmann spruce (*Picea Engelmannii*), and Douglas-fir (*Pseudotsuga menziesii*); one of each species.

Of the Osprey nests under surveillance in 1969, data was obtained from 63 as to physical description of the individual nest trees. Table 1 shows the relationship of height to nesting activity.

Table 1. Description of 63 Osprey nest trees and snags by height classes, Deschutes National Forest, 1969.

| Height Feet | Lodgepole Pine No. Dead | Lodgepole Pine No. Live | Ponderosa Pine No. Dead | Ponderosa Pine No. Live |
|---|---|---|---|---|
| 20 | 8 | 0 | 0 | 0 |
| 30 | 4 | 0 | 0 | 0 |
| 40 | 17 | 0 | 1 | 0 |
| 50 | 3 | 0 | 1 | 0 |
| 60 | 0 | 0 | 4 | 0 |
| 70 | 2 | 0 | 1 | 0 |
| 80 | 0 | 1 | 3 | 0 |
| 90 | 0 | 0 | 1 | 1 |
| 100 | 0 | 0 | 6 | 8 |
| 110 | 0 | 0 | 0 | 2 |
| Total | 34 | 1 | 17 | 11 |

Nest heights appeared to be related directly to visibility both to and from the nest. Visibility was good through the reservoir snags and nest heights were lower than in the timbered areas. In the reservoir, nests in lodgepole pine snags averaged 40 feet high and ponderosa pine snags averaged 60 feet.

In timbered areas, greater visibility was obtained by constructing the nests above the average height of the tree canopy. These ponderosa pine snags and trees averaged 90 feet and 100 feet tall, respectively.

Lodgepole pine nesting snags and the single live tree averaged 15 inches diameter breast high, and ranged from 10 to 24 inches. Ponderosa pine snags and trees averaged 39 inches diameter breast high and ranged from 24 to 50 inches.

The Osprey's choice of a nesting site in relation to the proximity of water varied. Forty-two of the 68 used nests were located in the reservoir proper, with the majority surrounded by water during most of the nesting season. The remaining 26 were located on dry ground in green timber, and were usually not visible from any body of water. Their distance from water or potential food supply is shown in the following list:

| Distance to Water | Number |
|---|---|
| Surrounded by water | 42 |
| Less than 1/8 mile (660 feet) | 9 |
| 1/8-1/4 mile (1,320 feet) | 1 |
| 1/4-1/2 mile (2,640 feet) | 3 |
| 1/2-1 mile | 4 |
| 1-2 miles | 6 |
| Over 2 miles | 3 |
| Total | 68 |

The Osprey, being colonial, does not exhibit the extreme territorial instincts of the other hawks. To gain some insight into intraspecific tolerances of nesting ospreys, the distance was measured from each active nest to the nest of its nearest neighbor. These distances are listed:

| Distance | Number |
|---|---|
| Less than 1/16 mile (330 feet) | 2 |
| 1/16-1/8 mile (660 feet) | 12 |
| 1/8-1/4 mile (1,320 feet) | 12 |
| 1/4-1/2 mile (2,640 feet) | 9 |
| 1/2-1 mile | 6 |
| 1-2 miles | 4 |
| Over 2 miles | 3 |
| Total | 48 |

These data indicate that most nesting birds prefer a minimum of 375 to 450 feet between their nesting trees. Two pairs, however, nested successfully within 150 feet of each other.

A Great Blue Heron rookery was found adjacent to the reservoir. This rookery was composed of a clump of five large ponderosa pine trees, containing 63 heron nests. A pair of ospreys nested at the top of one of these trees.

## Mortality Factors

Some nest damage occurred during the moderately severe winter of 1968-69 from wind and an abnormally heavy snow load. Six nesting snags toppled. Nests also fell apart, but were quickly repaired; several of them within a week's time.

Eighteen of the 48 active nests were abandoned. Records for four of these are lacking, but 14 were abandoned between approximately July 10 and July 25. Four of these were lost because the nests fell apart. Why the others were deserted is not known, but six nests were located near the edge between the snags and open water where use by fishermen was heavy. Abandonment may have been caused by

unsuspecting fishermen anchoring their boats near nests, which forced the female to leave the nest for extended periods, allowing the eggs either to chill or to overheat from the sun.

During the period July 5 to August 15, 13 renesting attempts were noted. New nests were constructed by 10 pairs. The other 3 used established nests. Some of these were close to abandoned nests, suggesting that the pair moved only a minimum distance from the old nest. In one case, when a nest fell apart a few days prior to fledging, an adult bird was seen reconstructing the nest around the two young.

One crippled bird was found in 1969, but it could not be determined whether the bird survived. There is other circumstantial evidence of malicious shooting, but the extent of this practice is not known.

## SUMMARY

The Deschutes National Forest is home for the Oargest Osprey colony in the Pacific Northwest. In 1969, there was a known breeding population of 48 pairs. Most of these nested in or closely adjacent to Crane Prairie Reservoir, where numerous snag nest sites and an abundant forage fish supply are found.

The U. S. Forest Service and Oregon State Game Commission have established the 10,600-acre Crane Prairie Reservoir Osprey Management Area to protect and enhance the Osprey habitat; to protect the birds; and to provide public enjoyment. Management measures now in effect include a "no hunting" ban during nesting season (April 1 to September 30); "no timber cutting" and "restricted timber cutting" zones around the reservoir; restriction on use of persistent pesticides; a "restricted activity" zone around nests; and an Osprey nest replacement program.

A 1969 survey showed 25 successful nests with a total production of 35 fledglings, or 1.4 young per successful nest. Eighteen nests were abandoned, and there were 10 renesting attempts. Most nests were in ponderosa pine and lodgepole pine snags, usually located in or very near water. The nesting birds usually preferred a buffer area between nests of 375 to 450 feet.

## ACKNOWLEDGEMENTS

Appreciation is expressed to Mr. Jay S. Gashwiler, Research Biologist, Bureau of Sport Fisheries and Wildlife, for his advice and critical review of the manuscript. Thanks are also extended to my co-workers on the Deschutes National Forest for providing information on the location of Osprey nests. Many of these would have gone unnoticed were it not for their efforts.

Special thanks go to Willard E. Nelson, State Supervisor, Division of Wildlife Services, Bureau of Sport Fisheries and Wildlife, for 20 years of nesting data he provided.

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# EXCERPTS FROM THE ABSTRACTS OF THE XV INTERNATIONAL ORNITHOLOGICAL CONGRESS
## (held at The Hague 30 August–3 September 1970)

**Selected by Frances Hamerstrom**
**Plainfield, Wisconsin 54966**

Part II
Sectional Sessions

F. GUDMUNDSSON—Museum of Natural History, Reykjavik, Iceland

*The predator-prey relationship of the Gyrfalcon (Falco rusticolus) and the Rock Ptarmigan (Lagopus mutus) in Iceland*

Since 1963 a relatively isolated population of the Rock Ptarmigan has been studied closely on an 800 ha island (Hrisey) in N. Iceland. This work included study of the effects of predation on the ptarmigan population. The work was much simplified by the fact that there were no ground predators on the island and that the Gyrfalcon was the only avian predator there.

In the past most investigations on food selection and predation by birds of prey have been carried out at the eyries of the respective species and have consisted in the collecting of food remains and pellets. The present investigation, however, consisted in ascertaining the effects of predation on a ptarmigan population of known size and how the different sex and age cohorts were affected.

It has previously been shown (Gudmundsson, 1960) that ptarmigan in Iceland are subject to violent population changes and that they fluctuate according to the pattern of a regular 10-year cycle. The year 1966 was a peak year and hence the present study covered the last years of increase before the peak was reached, the peak year itself, and the crash years immediately following the peak.

Despite a heavy predation by Gyrfalcons on Hrisey it is concluded that the regular and predictable population changes in the ptarmigan could in no way be attributed to predator-prey oscillations. But as the ptarmigan is the staple diet of the Gyrfalcon in Iceland it is not surprising that the Gyrfalcon fluctuates with the ptarmigan and that during years of ptarmigan scarcity many Gyrfalcons do not nest at all.

E. NIEBOER—Biological Laboratory, Free University, Amsterdam, the Netherlands

*Sexual dimorphism in harriers*

Harriers *(Circus)* form a structurally well defined, and geographically nearly cosmopolitan group. They are long-winged, long-tailed and long-legged birds of prey living in open country. Their methods of flight and hunting are characteristic. With the exception of one species, harriers nest on the ground.

The sexual dimorphism in harriers is exceptional among birds of prey, as many species show differences both in structure and in plumage. In the latter case the females have a cryptic coloration, probably associated with nesting on the ground. The light grey or grey-and-black plumages of the males may be considered to be adaptations to hunting and to display flights.

Sexual dimorphism in the plumage of harriers is considered an adaptation to nesting on the ground. It is an advanced character, as it occurs most frequently in what are probably the most recent faunas of the world (holarctic fauna). If the colour of the male is advantageous for hunting special types of prey, the difference in plumage might induce different food preferences in males and females.

C. KONIG—Staatliche Vogelschutzwarte, 714 Ludwigsburg, Germany

*Mobbing of small passerine birds in response to the song of the Pygmy Owl (Glaucidium passerinum)*

The Swiss ornithologist Thonen observed that in areas inhabited by Pygmy Owls, small passerine birds show a mobbing reaction in response to the song of this owl. During the last six years the present author has been studying the biology and the behaviour of the Pygmy Owl. In view of the mobbing behaviour he arrived at the following results:

1. Mobbing in response to the song of the Pygmy Owl is **not** inherited.
2. As the Pygmy Owl is generally a diurnal bird, the small passerines living in its territory learn that the voice comes from an enemy. Therefore tits, chaffinches, tree-creepers etc. show the mobbing reaction only in those areas where Pygmy Owls occur. In forests where this species is absent, the birds do not show this reaction. Mobbing therefore is a good help in finding Pygmy Owls.

3. According to our own observations only the Coal Tit (*Parus ater*) among all other small passerines, seems to show mobbing behaviour in specific response to the Pygmy Owl.
4. By recording mobbing Coal Tits the occupied territory of a Pygmy Owl can be defined. For this purpose the song of the Pygmy Owl has to be imitated at short intervals when walking around the forest. At the border of the owl's territory the reaction becomes weaker and finally ceases.

In order to study the problem of how Coal Tits learn to recognize the song of the Pygmy Owl as the voice of an enemy, some Coal Tits were kept in captivity. Experiments in the field showed that the birds learn to combine the inherited visual scheme of an owl with its song and finally react when only the song is heard without the owl being seen. The most frequent reaction is that one or two Coal Tits start mobbing and that they are followed by more and more birds to do the same. So finally, a large group of small birds fly crying about in the trees, looking for the elusive enemy. When the tits do not meet the owl any longer, they can forget its song and do not react to its imitated song any longer. This may happen after several months, but is more clearly apparent the next year.

By making use of these facts we could establish the decrease of the Pygmy Owl even leading to its total extinction in the Black Forest (S.W. Germany).

V. M. GALUSHIN—State Pedagogical Institute after V. I. Lenin, Moscow, U.S.S.R.
E. A. LIKHOPECK—School Science Teaching Unesco Project, New Delhi, India

*Predation by birds of prey on Tetraonidae populations at Vladimir Station near Moscow, U.S.S.R.*

Among factors which influence the population dymanics of Tetraonidae predation by birds of prey seems to have rather a specific significance. Due to exaggeration of its effect, birds of prey seriously suffered from hunters and game keepers in many countries.

One of the main aims of our study at the Vladimir station (about 200 km to the east of Moscow) in 1963-1965 was a quantative estimation of the pressure of predatory birds upon game bird populations. The influence was characterized by an index of predatory pressure (or index of predation). This means the percentage of individuals taken by all predators out of the total number of their potential victims within the area under consideration during a definite period of time.

In order to calculate the index of predatory pressure ($X_a$)

exercised by a predatory species "A" upon the population of a prey species "A" we collected the following data:

(1) The total number of predatory birds of species "A" ($N^A$) which inhabit the area under consideration. For this purpose the number of breeding pairs was counted and mapped.

(2) The average number of individuals of prey species "a" taken by each predator "A" ($P_a^A$) within a definite period (usually the breeding season). In order to set reliable data on the composition and number of prey of various species of birds of prey, we made continuous observations from hides built in trees close to occupied nests. We collected samples of the prey brought to the nests for further laboratory examinations.

(3) The total number of individuals of the prey species "A" ($n_a$) within the study area.

With the help of these data, the index of predatory pressure ($X_a^A$) for predator "A" and prey "a" has been calculated by the formula:

$$X_a^A = \frac{N^A \cdot P_a^A}{n_a} \quad 100\%$$

The entire population of birds of prey within the Vladimir station (210 sq. km, including 152 sq. km of forests) consisted of 6 species. Their total number fluctuated from 32 breeding pairs in 1965 (15.2 pairs per 100 sq. km) to 40 pairs in 1964 (19.0 pairs per 100 sq. km). They included Buzzard (*Buteo buteo*, from 17 to 23 pairs), Sparrow-Hawk (*Accipiter nisus* 4-6 pairs), Honey Buzzard (*Pernis apivorus*, 0-5 pairs), Black Kite (*Milvus migrans*, 2-3 pairs), Kestrel (*Falco tinnunculus*, 1-4 pairs), and Goshawk (*Accipiter gentilis*, 2 pairs).

The populations of 3 species of Tetraonidae were rather large: 2900-3000 individuals (adults and young) in June. It included 1200-1400 Hazel Grouse (*Tetrastes bonasia*) 1000-1200 Black Grouse (*Lyrurus tetrix*) and 500-600 Capercaillies (*Tetrao urogallus*).

Only goshawks and buzzards fed on game birds. Each breeding season (June-July) the two pairs of goshawks took 110-140 individuals of Tetraonidae mostly young): 50-70 Hazel Grouse, about 20 Black Grouse and about 10 Capercallies (the remaining ones unidentified). So the goshawk's index of predation on the Tetraonidae population fluctuated from 3.7 per cent (1965) to 4.5 per cent. (1964) of the total number of Tetraonidae present. It was 4.2-5.2 per cent. for Hazel Grouse, 1.6-2.1 per cent. for Black Grouse and 1.4-2.0 per cent. for Capercaillies. All buzzards in June-July took only 20-70 individuals of Tetraonidae mostly young of Hazel Grouse. The buzzard's index of predatory pressure upon Tetraonidae depended obviously on the density of rodent populations. It was 0.7 per cent. of the total number of Tetraonidae in 1963 (coordinating with highest level of rodent population) and 1.9-2.3 percent. in 1964

and 1965 (during low numbers of rodents. Its index of predation on Hazel Grouse was 0.4 per cent. in 1963, 1.6 per cent. in 1964 and 4.8 per cent. in 1965.

The entire index of predatory pressure by birds of prey on the Tetraonidae population was estimated as 4.9 per cent. of their total number in the summer of 1963, 6.4 per cent. in 1964 and 6.0 per cent. in 1965. For the Hazel Grouse these figures were 5.4, 6.9 and 9.0 per cent., respectively; for the Black Grouse 2.1, 3.7 and 1.7; for the Capercaillie 1.8, 2.0 and 1.4 per cent.

The above results permitted a more realistic approach to the role of birds of prey in game management. The official attitude towards them was also changed and since 1964 wholesale measures for the control of birds of prey and especially bounty payments for killing any kind of them were banned all over the Soviet Union. Limited control was allowed only for the Goshawk and Marsh Harrier within specific hunting grounds.

H. C. MUELLER—Department of Zoology, University of North Carolina, Chapel Hill, N. C., U.S.A.

*Experiments on prey selection in hawks*

The experiments were designed to test the role of the following in prey selection: (1) conspicuousness; (2) oddity, or a difference between a given animal and the majority of prey; and (3) the specific searching image or the tendency to habitually prey on a given kind of animal. White laboratory mice, some of which were dyed grey, were placed on 10 small pedestals equidistant from a tamed hawk on either a grey or white background. In one series of experiments, 9 mice of one color (grey or white) and one of the other color were offered on either a grey or a white background in four combinations of mice and backgrounds. The sequence of presentation of background and mice combinations was randomized. Under this regime, hawks selected odd mice of a particular color. Conspicuousness of the mouse (contrast with background) affected prey selection only until the preference for a color was established. In another series of experiments the hawks were presented with 9 mice of the preferred color and one of the other. After 50 experiments (sufficient to yield statistically significant results), the number of preferred mice was then reduced to eight and the number of the other color to two. The procedure was continued stepwise through almost 200 experiments until the hawks were offered one mouse of the preferred color and 9 of the other color. The hawks selected significantly more of the preferred color throughout the experiment except for the first step or two when the non-preferred color was uncommon or odd. The results are interpreted to indicate

that development of a specific searching image is the most important factor influencing prey selection and that there is also a tendency to take odd prey. These findings have important implications for various concepts of population regulation and evolution.

In addition to the above, I would like to call particular attention to another paper:

J. C. COULSON–Department of Zoology, Durham University, Durham City, U.K.

*The pair bond and the breeding success in the Kittiwake Gull (Rissa tridactyla)*

I suggest that those interested in raptors study this brilliant work–a model for raptor studies!

The proceedings of the XV International Ornithological Congress will be published in book form–limited to the plenary sessions, which I mentioned in Part I. Coulson's paper will be included. The papers I have mentioned in Part II are apt to appear in various periodicals.

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